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URETERITIS IN THE FEMALE.

BY EDGAR GARCEAU, M.D.,

OF BOSTON, MASS.,

SURGEON TO OUT-PATIENTS IN THE FREE HOSPITAL FOR WOMEN, AND IN ST. ELIZABETH'S HOSPITAL, BOSTON, MASS.

A CONVENIENT classification of ureteritis is the following:

Simple ureteritis.

Ureteritis with obstruction.

Tubercular ureteritis.

SIMPLE URETERITIS. This form may be either acute or chronic. In the acute cases parturition seems to have a decided influence as an etiological factor. Hallé¹ and Morris² think that the pressure of the child's head, by causing trauma, offers a favorable soil for the development of the disease. Primiparæ are especially affected. The disease is ushered in with chills and fever, and a condition of general sepsis is the result. There is pelvic pain and vesical irritation, and pressure vaginally over the affected ureter is very sensitive. In a few days after the onset of the disease pus may be seen in the urine in large amounts. If the kidney is seriously affected the prognosis is grave, and death may ensue.

¹ Urétéríte et Pyélite, Paris, 1887, p. 148.

² Surgical Diseases of the Kidneys and Ureters, London, 1901, vol. ii. p. 398.

The diagnosis of acute ureteritis of this nature is difficult unless one recognizes the possibility of the disease. Pyelonephritis is more easily recognized from focal symptoms. It is doubtful if simple acute ureteritis ever exists alone, and if it does, it can be diagnosed as such. Usually it is part of a pyelitis or of a cystitis, and the symptoms of these affections so overshadow those of the ureteritis that the latter escape detection.

Diphtheritic ureteritis has been found at autopsy. In the Boston City Hospital records there are 2 such cases occurring in 3424 autopsies. In the first case the bladder and both ureters were covered with the typical black membrane, and in the other the renal pelves and upper part of both ureters were affected.

CHRONIC URETERITIS. A ureteritis may be the sequel of either a vesical or a renal inflammation, and as vesical inflammations are more common than the renal, we usually find a chronic cystitis associated with the ureteritis. Infection from a ureteral fistula is easily understood. Infection from the diseased bladder would be more common if the valve at the ureteral opening did not act as a determined barrier to the entrance of germs, and when we consider the large number of cases of cystitis we must allow, from the relatively rare occurrence of ureteritis, that the valve does in reality act as a barrier in this way. I have seen in a case of tubercular cystitis infection resisted for five years by the remaining kidney and ureter after nephrectomy for the opposite tuberculous kidney. But that this valve does not always act in this way has been abundantly proved by the experiments of Young¹ and of Lewin and Goldschmidt.² They all found that injection of methylene blue under high pressure and rapidly would not result in reflux of the dye into the ureters of animals, but that if injected slowly reflux would sometimes occur. Coutade and Guyon³ also experimented in the same direction, and found that if the bladder were injected in this way—*i. e.*, largely and slowly—reflux into the ureter occurred in two-thirds of the cases in rabbits and in one-fifth of the cases in dogs. Hallé⁴ lays particular stress on the method of invasion of the inflammation into the ureter by means of direct extension of the inflammation along the mucous membrane, and he brings in support of this view the fact that lesions around the ureteral orifice and bladder are older in appearance than those in the ureter. He believes that reflux of septic urine into the canals must be of relatively rare occurrence. In the rare cases of urethral stricture in the female, the mechanism of infection is the same as that in the male. There is retention of urine in the bladder and later stagnation of urine in the ureters. This

¹ A. H. Young. Johns Hopkins Hospital Bulletin, 1898, No. 86, p. 105.

² Virch. Archiv, 1893, vol. cxxxiv. p. 33.

³ Leçons Cliniques sur les Maladies des Voies Urinaires.

⁴ Op. cit., p. 132.

leads to dilatation, first of the ureters and later of the ureteral orifices; infection is then easy by direct invasion into the ureters of the germs in the bladder when the bladder contracts in its expulsive efforts.

The gonococcus is the germ most to be dreaded as a cause of ureteritis, on account of its well-known disposition to result in stricture. Ureteritis may occasionally originate from calculous pyelitis, and the infection may reach the bladder, where it may cause characteristic changes, to be described later. The infection from pus-tubes, inflamed lymph glands, and pelvic cellulitis has been known to cause ureteritis, the infection in these instances travelling through the lymphatics.

The pathology of the disease is that of mucous membranes elsewhere in the body. There is reddening of the tissues and desquamation of the epithelium. Occasionally the inflammation extends through the ureter to the tissues around it. The symptoms will vary with the extent of the urinary tract involved. If the kidney has been the starting point of the disease, or if the kidney has been affected secondarily by an ascending infection, we may expect some renal pain or at least some discomfort in the lumbar region on the affected side. This sign is by no means constant, however, and it may be absent. As the bladder is generally if not always affected, the symptoms are mainly referred to it; so we find frequency of micturition the chief symptom. The desire to urinate never leaves the patient, and it constitutes the principal source of suffering. The calls to urinate vary with the degree of severity of the disease and with the stage. There are temporary remissions, but these can hardly be called remissions, as the suffering is constant, even during these. Generally the patient has to empty the bladder at least once an hour by day and several times by night. Occasionally urination is required every fifteen minutes by day and ten or twelve times by night. The act is usually painless, but sometimes pain is experienced deep in the bladder, on one side, in the vicinity of the affected ureter. The pain in these cases is of an aching character, and it may last as long as half an hour after the act of urination. Tenesmus may or may not be present, and incontinence is very rare. Perhaps the most distressing source of suffering is that caused by the excessive degree of neurasthenia which is the inevitable result of the incessant suffering and the loss of sleep. The patient is very apt to lose flesh, is irritable, peevish, and has no object in living. The digestion is disturbed and constipation is common. Headaches are experienced and also the typical pressure feeling on the top of the head, as well as the various neuralgias so often accompanying severe degrees of neurasthenia.

The most important sign on physical examination is the greatly increased tenderness of the affected ureter when pressed upon vaginally as compared with the opposite ureter. When the ureter is thus pressed upon there is a coincident extreme desire to urinate, which is with diffi-

culty controlled by the patient. If the ureter has been diseased a long time it is possible that there may be some enlargement which may be discovered vaginally. It is difficult to see how a moderately thickened ureter could be felt through the abdominal walls unless these were very thin or relaxed. But pressure along the course of the ureter is often elicited, especially at the pelvic brim, and this is an important diagnostic sign.

On cystoscopic examination the trigone and vesical neck will be found congested to a more or less degree. There may be patchy cystitis on the posterior wall, but usually if the affection has lasted some time the bladder as a whole will present a relatively normal appearance. The most important sign which I have observed in these cases of simple ureteritis is swelling of the ureteral eminence on the affected side. As compared with its fellow on the opposite side it is much larger, especially if viewed with the patient in the knee-chest position. Besides this, it is invariably red and at times streaky, the streaks proceeding from the ureteral opening. The entrance to the ureter on the summit of the eminence is swollen and puffy, and at times the mucous membrane inside the canal may be everted so that it presents as a small red spot. Ulcerations are rare even if the affection has lasted for years.

There is one sign presented by the examination of the urine which I have found of the greatest diagnostic importance, and this is an excess of desquamated epithelium, which may or may not be associated with the presence of pus on the affected side. This epithelium may be free or in sheets, and it is medium-sized or small, round, or spindle shaped, or even squamous. If the inflammation is confined to the ureter, and the renal pelvis is not affected, pus is always in very small amounts, and, as has been mentioned, may be entirely absent or imperceptible. This same peculiarity is also seen even in the tubercular forms of ureteritis if the ureter alone is involved—*i. e.*, there may be a considerable excess of epithelium, and very little pus. Occasionally blood corpuscles are seen, and if the kidney has been invaded a few granular and hyaline casts may be found.

The utmost care must be taken in collecting the urine from the ureters so that there shall be no admixture with vesical elements, and also that trauma during instrumentation shall be avoided. For this purpose the only serviceable cystoscope is that of Kelly, which has the oblique end. With this instrument the urine drops into the end of the tube directly from the ureter, and may be collected in a bottle at the outer end of the tube.

Reynolds¹ has called attention to the fact that the amount of urea on the affected side as compared with the opposite side is diminished,

¹ Gynecological Transactions, 1896, No. 21, p. 282.

and he brings eight cases in support of this view. My experience has been similar, and I am inclined to think that the ureteral inflammation must exert an inhibitory effect on the excretion of the urinary solids. I have observed the same peculiarity in a case of renal calculus associated with ureteral calculus, although the kidney when removed, with the exception of the stones in it, was apparently healthy, there having been no suppuration. The separated urines before operation showed a marked difference as regards the urea excretion in favor of the sound side.

The amount of urine will often be scanty, and Mann has seen it as low as 180 c.cm. in the twenty-four hours. It is usually acid in reaction, and has a low specific gravity. It must not be supposed that the amount of urine is always low, for cases will be met with in which the amount is normal or nearly normal.

The diagnosis of simple ureteritis is sometimes a very difficult matter. Most frequently it is not recognized at all, and the case is treated for years perhaps as a chronic cystitis or as a reflex bladder trouble of nervous origin. It is well then in the presence of such a case to proceed at once to a cystoscopic examination. This gives the most important aid in making a diagnosis. The characteristic lesions of the ureteral eminence of the affected side combined with the swollen appearance of the eminence itself, and also the study of the urinary sediment, will direct attention to the seat of the trouble and will be sufficient to establish the diagnosis. A vaginally tender ureter is an important sign.

There is one affection of the ureter with which ureteritis may be confounded, and that is ureteral stricture; but as stricture is a sequel of the disease, and as ureteritis always accompanies stricture, this is perhaps not the best way to put it. If stricture is suspected on account of the long duration of the case, passing graduated bougies will at once clear up the diagnosis. Tuberculosis of the ureter as a primary affection probably never occurs alone, and need not enter into the differential diagnosis. It is always a part of a renal or a vesical tuberculosis, or both, and the symptoms and signs of either are usually sufficiently marked to allow of a diagnosis being made. Salpingitis and ovaritis may be mistaken for ureteritis, and the failure to relieve symptoms by removal of the ovaries and tubes may be due to the fact that the co-existing ureteritis was not recognized. This error ought not to occur. Other inflammatory pelvic disorders, such as appendicitis, have been mistaken for ureteritis; a careful study of the case will clear up the diagnosis.

The prognosis of the disease is very poor if it has lasted a long time; but if recognized early, and it has been properly treated, the prognosis is encouraging. In the very chronic cases treatment has been very unsatisfactory, and alleviation of symptoms has been all that has been

accomplished. All methods of treatment have been tried, but most of them have been found to be of little value. The difficulty lies in the fact that the disease is situated in such a small tube in the centre of the body that it cannot be reached by direct means. The treatment has been largely palliative, therefore, and has been confined to the administration of drugs combined with general hygienic measures. Much may be accomplished in this way, and these measures should always be insisted upon. As a preliminary to treatment a diseased tube or ovary, if it lies over the course of the ureter, should be removed. The same applies to other diseased pelvic conditions. The diet should be carefully regulated with reference to the kind of food given. It should be bland and nutritious. Too much nitrogenous food should be avoided, and also those foods which tend to make the urine irritating, such as asparagus and rhubarb. A simple diet of farinaceous food should be given, such as eggs, soups, broths, fresh green vegetables, the white meat of poultry and game, occasionally beef, mutton, or lamb, plenty of milk, and, above all, a large amount of water. If the stomach is irritable it may be difficult to select the proper diet. Mann has seen excellent results follow a restricted milk diet. Attention to the bowels is of importance, as a loaded colon pressing on the ureter is productive of pain. The function of the skin should receive attention, and hot baths and rubbings are recommended. The patient should take the fresh air every day, if she is able to be out and if exercise is not fatiguing; if it is, sitting out in the air is the next best thing.

Regularity of living is essential. The patient should retire early, and she should likewise take a good deal of rest in the recumbent position in the day-time. Overexertion invariably aggravates the condition. The drugs usually of benefit in vesical inflammations may be tried. If the urine is acid, decided benefit will be derived from giving acetate of potassium in large doses. Sandalwood oil sometimes relieves symptoms, but it is irritating to the stomach. Urotropin is sometimes of value, but it appears to do most good in cases in which there is a large amount of pus in the urine. Bicarbonate of soda in large doses may be tried, particularly if there is acidity of the stomach; it is sometimes of great value. Alcohol should be avoided. For general tonics, iron, arsenic, and strychnine may be given. Morphine should never under any circumstances be given, on account of the great danger there is of forming the habit. Patients tolerate the disease many years without recourse to morphine, and it is quite unjustifiable to use it. A good remedy for sleeplessness is trional; one or two 10-grain doses at night will generally give some sleep, and it may be freely used. No habit is formed, and it may be withdrawn at will.

Topical applications to the bladder have done much good in these cases. A solution of nitrate of silver in a 5 or 10 per cent. strength

applied to the trigone and to the ureteral eminence once or twice a week gives considerable relief. A vesical injection of a 5 per cent. solution of protargol or a 50 per cent. solution of ichthyol have proved satisfactory. About 2 drachms of either may be injected, and the injection should be retained at least half an hour.

The rational method of treating the ureteritis itself would seem to be by means of topical applications to the ureteral canal. The instrument shown in the figure is one which I devised for injecting the ureter through a cystoscope in the bladder. It consists of a long, straight silver tube with a blunt-pointed extremity and a bulbous expansion a short distance from its end. A rubber tube connects the instrument



with the reservoir bottle containing the fluid to be injected, which fluid is forced by air pressure into the silver tube by means of a rubber hand-bulb. By working the hand-bulb the silver tube is filled with the fluid, and in this condition, the air having been thus expelled, it is introduced into the ureteral orifice. The instrument enters the canal, and is pushed along it until the bulbous expansion reaches the ureteral orifice. A little extra pressure is now exerted so that the bulbous expansion may come in close contact with the orifice in order to prevent regurgitation of the fluid injected. Quite considerable pressure with the hand-bulb is now exerted, and the ureter and renal pelvis are injected. That the fluid is really injected is evidenced by seeing it come out of the ureteral orifice in a strong stream when the instrument is with-

drawn. The patient experiences some pain in the ureter, but it is tolerable. Occasionally she complains of some backache in the region of the kidney injected. I have proved by an experiment on the cadaver that the whole renal pelvis can be injected in this way. A solution of methylene blue was used and the instrument used in the way described. When the kidney and ureter were subsequently opened they were found to be deeply stained with the dye; all parts of the renal pelvis were of an intensely blue color. The only solutions which I have yet tried, for the instrument is new, have been boracic acid, 2 per cent., and nitrate of silver, 1 per cent. They were well tolerated. The treatment was done in my office, and the patient returned home unaccompanied. As to the results of this treatment it is too early to say, for I have done it only a few times. The patients upon whom it was tried always experienced relief after the applications, especially during the night following the treatment, and they had to get up to urinate less often than ever before.

If all means have failed to relieve the symptoms and these are urgent, the only remedy left is the making of a vesicovaginal fistula; but even this will not in all cases relieve the symptoms wholly, for the irritation, being in the ureter, is still present, and the nagging desire to urinate although relieved in a measure, may not entirely disappear. If there is well-marked cystitis the fistula should be made; some relief will be sure to follow.

Mrs. F. P., first seen in December, 1899, was forty-three years old, had been married twenty years and had had seven children. Three years before she had an attack of severe colic in the lower part of the abdomen, the attack having come on immediately after the birth of the youngest child. Since then there has been urinary trouble. When first seen she was urinating every few moments, the pain being always felt on the left side of the bladder, in the vicinity of the left ureteral orifice and ureter. Besides this there was also pain in the urethra. There were some dyspeptic symptoms attended with flatulency and constipation. The general health was poor, and she was very nervous and irritable at times, and her sleep was much disturbed.

An examination showed a lacerated cervix and perineum, cystocele, and rectocele. Abdominally both kidneys were negative, but upon pressure over the course of the left ureter it was sensitive, especially at the lower end, and vaginally the finger discovered a very sensitive and somewhat enlarged ureter, which when pressed upon excited an intense desire to urinate. A cystoscopic examination showed a red urethra, vesical neck, and trigone. The left ureteral eminence was larger than the right one, and it presented a swollen and puffy appearance; it was quite red, and its orifice was somewhat pouting. The right ureteral urine collected with the oblique-end cystoscope was normal. The left ureteral urine was acid in reaction, and its sediment, evident to the eye and imparting a turbidity to the urine, showed a great excess of medium and small round cells, likewise numerous caudate and spindle cells, as

well as a few casts and some blood corpuscles; there was no pus. There was one peculiarity which was particularly noticed while collecting the ureteral urine which I have not before observed in any case, and this was that while the right ureteral urine came away in strong jets at frequent intervals, the left ureteral urine was scantier in amount and came away in jets occurring at longer intervals than on the right side. By estimation only half the amount of urine flowed from the left ureter during the time that twice the amount flowed from the right, and the jets on the left side occurred at twice as long intervals as those on the right, and they were feebler in force. This observation is in line with the diminished urea excretion in these cases.

The patient was put upon a regulated diet, and was told to drink a large amount of water and to take the fresh air every day. Besides this, local applications of nitrate of silver in the strength of 5 and 10 per cent. were made to the trigone and ureteral eminence every few days for a long time. After having been under treatment a few months she underwent an operation for the cure of the lacerations. The operation was successful, and since it was performed the bladder symptoms have been decidedly less troublesome. The internal medication consisted in taking urotropin, acetate of potassium, and bicarbonate of soda. Later, injections of a few drachms of a 5 per cent. solution of protargol into the bladder, which were retained half an hour, seemed to do a great deal of good. Most relief has been obtained by injecting the ureter with a 1 per cent. solution of silver nitrate at intervals of a few days. On the whole the patient is decidedly better, but she is by no means well, and still suffers a good deal from the pain on the left side of the bladder; and urination, while it has been reduced by the treatment to four or five times a day and once or twice at night, is still quite painful. The case illustrates very well how meagre our therapeutics are in this class of urinary disease. The patient has been very faithful in following every detail of treatment during the past three years, and while she is by no means well, she considers that she would have been much worse had she not been under treatment.

URETERITIS WITH OBSTRUCTION. The obstruction may be partial or complete, and, according as this is the case, symptoms and changes will vary. The changes differ also according as infection has taken place or not. If it has not taken place, and the obstruction is complete, we may get simple hydronephrosis. If this happens on one side only it may be the only permanent change, and the final result, if the obstruction is not removed, is complete atrophy of the kidney. Inflammatory changes in such a case are likely to supervene if the obstruction has been caused by an inflammatory mass pressing upon the ureter, such as a purulent salpingitis. In such an event pyonephrosis becomes engrafted upon a hydronephrosis. Infection in such a case may also proceed from the kidney itself, the result of germs excreted by it. Albarran¹ has shown that secondary infection is common and that the germ most frequently found is the bacterium pyogenes.

¹ Etude sur le Rein des Urinaires, Paris, 1889, p. 105.

The causes of strictured ureter are given by Morris as follows: (1) Valve of mucous membrane near renal pelvis; (2) valve caused by obliquity of ureter to renal pelvis; (3) fibrous stricture (gonorrhœal); (4) ureter compressed by branch of renal artery; (5) calculus in the ureter; (6) fibrous band at the brim of the pelvis; (7) twist of the ureter on its long axis; (8) compression of the ureter by enlarged lymphatic glands; (9) conversion of the ureter into an impervious cord. Of all these causes, those which are usually associated with inflammatory changes are fibrous stricture and calculus. These two only will therefore be discussed.

Obstruction may be partial or complete. By partial obstruction is meant that the urine always has sufficient passage to flow through the narrow canal, and that the stricture is never so tight as to even temporarily occlude the urinary canal at the diseased point. The symptoms of this class of cases will proceed, therefore, from the accompanying ureteritis rather than from the stricture itself. By complete obstruction is meant that the canal is completely occluded or that it is subject to intermittent closures. The result is practically the same—ultimate disorganization of the kidney above.

Partial Obstruction. Fibrous Stricture. The chief cause of fibrous stricture is gonorrhœal infection. The stricture may, however, result from ureteritis from other infections, and also from trauma inflicted by the passage of a renal calculus. Occasionally external inflammation around the ureter will result in stricture. It is very probable that many cases of strictured ureter in the past have been diagnosed as neuroses, cystitis, hyperæmia of the vesical neck and trigone, reflex irritable bladder, etc., because the chief symptom of the disease is frequency of micturition. This obscurity has been due to the difficulty of arriving at the correct diagnosis, for it is made solely by instrumentation. The duration of the disease, untreated, is practically chronic. In one of my cases the duration was twenty-five years, the patient having suffered all that time. The symptoms of the gonorrhœal cystitis glide imperceptibly into those of the ureteritis; and as they are nearly identical, the patient is treated for the cystitis alone, and no attention is paid to the ureter, the chief seat of the chronic disease.

The symptoms of the disease are those of simple ureteritis, and they need not, therefore, be repeated in detail. We have the renal pain and distress if the kidney has been invaded; it is not usually marked, and it is not elicited, as a rule, from the patient unless special attention is directed to it. The urinary symptoms are in part due to the cystitis usually present in these cases, in part to the inflammation of the ureter itself, for we find when the cystitis is cured or almost cured that frequent micturition, attended or not with pain, still persists. The chief distress comes from the constant desire to urinate, which

never leaves the patient. This desire to urinate is peculiar. The patient is never satisfied, and she always feels that if she could only empty the bladder satisfactorily she would be relieved. The phrase "nagging desire to urinate" was used by one of my patients to describe the sensation felt. Tenesmus and incontinence are the same as in simple ureteritis. Neurasthenic symptoms, as one would expect from the long duration of the disease, are of a marked character. The patients are wretched and miserable. The tender ureter is found vaginally, and the cystoscopic appearances are the same as in simple ureteritis, and need not be repeated. The streaky appearance of the eminence and the swollen eminence itself are noticed. The separated urines have the same characteristics as in simple ureteritis without stricture, and I would especially insist on the presence or excess of desquamated epithelium on the affected side, with or without pus and blood corpuscles. The total amount of urine may be diminished, and a quantitative analysis will show a diminished excretion of solids. It is acid, of low specific gravity, and may contain a slight amount of albumin.

The diagnosis is at once made with the ureteral bougies. On passing these in turn into the ureter one will be found which will be arrested at a certain point, the seat of the obstruction. If more than one stricture exists in the same ureter the diagnosis of the high ones is impossible unless the lowest one is of greater calibre than the higher. There are normal narrowings in the ureter, and the mistake should not be made of confounding these with pathological strictures. These normal narrowings are found, according to Van Hook,¹ at the following points: the first is at a point between four and seven centimetres from the renal pelvis, the second is where the ureter curves over the pelvic brim (in three out of five), and the third is at the junction of the vesical and ureteral portions.

The prognosis of strictured ureter has been sufficiently intimated. It is a long-standing affection, and it is very difficult to cure. The chief source of danger is on the part of the nervous system, which is constantly irritated; and even if the patient is cured, months may elapse before the mental equilibrium is re-established.

The treatment of the affection should have for its end the complete restoration of the lumen of the canal. Dilatation of the stricture has been proposed, and it has this to recommend it, that it does not involve a cutting operation. The number of reported cures by this method of treatment is as yet so few that we cannot form any idea of its position as a therapeutic measure. We do know, however, that it will give relief from symptoms. The chief objection to the method is that it is extremely painful at times. Urinary fever and chills occasionally follow

¹ Surgery of the Ureters, Journal of the American Medical Association, December 1, 1893.

ureteral dilatation, and Morris¹ relates a case in which the vesical orifice of the ureter was torn in an attempt to dilate a high stricture. The orifice subsequently became completely closed. If it is desired to attempt dilatation it is best to use either Kelly's graduated renal catheters or the French ureteral bougies. These should not be passed more than once or twice a week. If gradual dilatation fails, or if the patient will not submit to it, one of the operations recommended for the cure of the condition may have to be performed. The best one is that which exposes the ureter through an extraperitoneal incision after preliminary introduction of a ureteral catheter. The stricture may then be cut upon the catheter and the two angles of the incision united together by means of fine sutures. The sewing should not be done until the rest of the canal has been explored for high strictures. If the stricture is of great length, and it happens to be situated near the bladder, it is advisable to transplant the ureter, which may be cut off just above the stricture, into the summit of the bladder. Any stricture below the pelvic brim may be treated in this way. If there is a long stricture high up, and transplantation is not practicable, the only other resource is nephrectomy or the establishment of an artificial loin fistula. The condition of the opposite kidney and the general state of the patient should be considered in choosing between the two operations. Simple cystotomy in these cases has been tried, but the relief given thereby is very slight, because the spasm and pain, dependent as they are, upon the ureteral lesion, continue just the same after the cystotomy. This has been the experience of others as well as my own.² The only indication for cystotomy is coincident violent inflammation of the bladder.

Miss M. F., first seen in June, 1896, was forty-five years old. The vesical symptoms came on immediately after an attack of gonorrhœa, twenty-five years previously, and she has never been free from vesical suffering since then. The first symptoms of acute cystitis glided imperceptibly into those of chronic cystitis and ureteritis. There was increased frequency of micturition, attended with pain, and there was great distress from the constant desire to empty the bladder, which was never absent. There was a good deal of tenesmus, but never incontinence. Some pain was experienced in the region of the right kidney and also along the course of the right ureter at the level of the pelvic brim. There was some backache. Sleep was much disturbed, and the nervous system was a complete wreck. She was very irritable, had no object in living, and frequently threatened to commit suicide. On examination there was no tenderness over either kidney, but later this sign was present over the right one. Along the course of the right ureter there was no tenderness except at a point just above Poupart's ligament; here there was a good deal of sensitiveness on pressure.

¹ *Surgical Diseases of the Kidney and Ureter*, London, 1901, p. 440.

² See case reported by H. A. Kelly in *Johns Hopkins Hospital Bulletin*, 1891, p. 240.

Vaginally the right ureter was somewhat enlarged, and pressure on it was very painful and excited an intense desire to urinate. On cystoscopic examination the urethra, vesical neck, and trigone were much congested, and the right ureteral eminence, which was redder than the rest of the bladder, also had a streaky appearance; it was larger than the left eminence. The right ureteral urine showed a sediment of a great excess of epithelium, some casts, and an appreciable amount of pus. The left ureteral urine was not remarkable. The stricture of the ureter was not discovered for a long time, because it was not thought best to pass a catheter into the ureter through the infected bladder. In a similar case with a history of gonorrhœa it would be justifiable to do so.

The treatment of the case was that recommended for cystitis and ureteritis; but after a few months of treatment, no great improvement having been accomplished, a vesicovaginal fistula was made. This gave a tolerable existence for as long a time as it was allowed to remain open, which was five years. During this time she was relieved from the necessity of emptying the bladder, but she still had the nagging desire to urinate, which persisted in spite of the free drainage afforded by the fistula. When the fistula was closed, at the urgent solicitation of the patient, the old symptoms returned. In October, 1901, the stricture was discovered in the right ureter, at a point eight centimetres from the ureteral eminence. The stricture admitted a 1-millimetre probe. Dilatation was at once begun, and it soon admitted a 3-millimetre probe. Relief followed, and the nagging desire to urinate became much less in a short time; but it did not entirely disappear, and it has not up to the present time, owing to the persistence of the ureteritis. Lately injections of the renal pelvis have been instituted, and were given with the apparatus described in this paper. These have been well supported, and have given further relief. The patient is now in the best condition that she has ever been in, the ureteral injections always relieve her, and she usually has a good night's rest after the treatment. There is still an excess of epithelium on the right side, but the pus has entirely disappeared.

CALCULOUS OBSTRUCTION. It is not intended to enter into a complete discussion of calculous disease of the kidney and ureter, for that would extend the limits of this paper far beyond that intended. Reference will be made in a brief way to the symptoms and diagnosis of the affection and to the consequent ureteritis which it entails.

The narration of a typical case is perhaps the best way to describe the disease.

Mrs. F. C., aged twenty-five years, was first seen in July, 1898. She had been operated upon by Dr. W. H. Baker, of Boston, for salpingitis, in February, 1898, and panhysterectomy was performed. Seven years previously there had been an attack of true renal colic caused by a renal calculus, which was subsequently seen when passed *per urethram*; since then there had been urinary trouble. Five years after the onset of the trouble there was an attack of hæmaturia, the blood persisting for two days. The usual symptoms of cystitis and ureteritis were present. There was frequent and painful micturition, attended with tenesmus. In addi-

tion to this there was constant pain in the left hypochondriac and lumbar regions, which pain radiated into the bladder and vulva. Decubitus was always painful on the right side, and riding in the cars was painful as well as movements of a sudden nature. On physical examination there was no tenderness on pressure over either kidney, but there was a good deal of tenderness over the left ureter when it was pressed upon at the pelvic brim, and pressure on the ureter vaginally was very painful, and in this part of its course it was enlarged. On cystoscopic examination the urethra, vesical neck, and trigone were found to be scarlet red, and the whole bladder wall was streaked with red streaks one or two centimetres long and one or two millimetres wide; there were likewise small patches of the same nature scattered throughout the bladder. The left ureteral eminence was larger than normal, and on its surface, as well as on the surface of the trigone about it, there were very many small, yellowish dots, one millimetre in diameter, circular in outline, and of punctate appearance, as though punched out with a punch. The eminence bled easily on being touched. Scattered throughout the bladder were many small, whitish elevations (enlarged lymph follicles), resembling sago grains. The right ureter was easily catheterized, but not the left, owing to a tight stricture of the ureter situated eight centimetres from the bladder. The right ureteral urine showed a urea percentage of 1.13 per cent., and was of pale color, of acid reaction, and the sediment, considerable in amount, showed some pus free and in clumps, a few caudate and medium-sized cells, and a few granular and hyaline casts. The left ureteral urine, collected with the Harris segregator, showed a urea percentage of 0.4 per cent.; it was of pale color, of acid reaction, and the sediment was the same as in the right ureteral urine, except that the amount of pus was much larger. No tubercle bacilli were found in any of the specimens of urine, and guinea-pig tests were negative as regards tuberculosis. The treatment of the case was at first palliative, but as the pain in the kidney became more severe an exploratory incision was made in February, 1900. A large stone was found in the pelvis of the left kidney, and, as there were several other stones in the renal parenchyma, the kidney was removed. The stones were of the calcic oxalate variety. A probe passed into the ureter was arrested at the pelvic brim, and an X-ray picture taken later showed the obstruction to be a stone. Subsequent events justified leaving the stone in the ureter, for it has never given any trouble. No special treatment was given for the cystitis after the operation, and when the patient was last seen, in January, 1902, the bladder was perfectly normal. As she complains of pain in the right kidney occasionally, it is feared that there may be a stone in it as well.

What is most remarkable in the case is that while the bladder was the seat of violent inflammation, the renal pelvis was of normal appearance, in spite of the presence of calculi in it. The suggestion is at once offered that the stone in its descent was arrested by the pus-tube, and that ureteritis followed by continuity; the inflammation then spread downward into the bladder, and not upward at all. I would especially call attention to the vesical appearances in this case. The small punctate ulcers were quite characteristic, and I have never seen them in any other bladder that I have examined. Their grouping around

the affected ureter suggests a causative relation between them and the calculus, but one cannot draw conclusions from a single case.

The diagnosis of ureteral calculus may be made by a careful consideration of the details of the case. Occasionally¹ stones are lodged in the ureter, and they give no symptoms at all, and they may be passed several months later without discomfort. Usually, however, there is a history of previous pain in the kidney and along the course of the ureter, and there may have been attacks of renal colic with hæmaturia. If the patient has seen calculi in the urine, additional evidence is thereby furnished. The vesical symptoms are suggestive and point to cystitis, although there are cases of concomitant vesical irritability in which no true inflammation exists in the bladder, the irritability being due in such cases to reflex causes. The examination of the urine will throw considerable light on the nature of the disease, particularly the examination of the separated urines, and it is far better in securing the separated specimens to make use of Kelly's oblique-end cystoscope in order that adventitious blood corpuscles may be absolutely avoided; this, in view of the fact that it frequently happens that the blood in the urine in cases of calculi of the upper urinary passages is sometimes very scanty in amount, while its diagnostic importance is very great. The absence of pus does not exclude calculus, for it will not be found if infection has not taken place. The lessened urea excretion on the affected side is characteristic and shows the effect of inhibitory influences. The same peculiarity may be noticed in cases of ureteritis, as has already been mentioned. Cystoscopic appearances are suggestive. The punctate ulcers may prove to be of diagnostic importance, but as I have seen but one case it may merely go on record; confirmatory evidence is needed. Occasionally the ureteral stone may be felt through the vagina, and in such a case the diagnosis is at once plain. Finally, the X-ray may be employed in determining the diagnosis, and the wax-tipped bougie may be passed. Abbe² records 27 cases of stone detected in the ureter by means of the X-ray. Leonard³ in a series of 206 cases had 65 positive results. In these cases ureteral calculus was more frequently found than renal. Leonard believes that some skill is required in reading the negatives, for the shadow of the stone is not always distinct.

The differential diagnosis lies between cystitis, ureteritis alone, appendicitis, and other pelvic inflammatory affections. Tuffier⁴ called attention to the fact that a concretion lying in the appendix will sometimes give a radiograph picture which closely simulates stone, and he advises passing a wire into the ureter in order that it may be photo-

¹ Fenger. American Text-book of Genito-urinary Diseases and Syphilis, 1898, p. 496.

² Annals of Surgery, August, 1899, p. 198.

³ Philadelphia Medical Journal, February 11, 1902, p. 222.

⁴ La Semaine Médicale, August 9, 1899.

graphed with the concretion; the different locations of the wire and the concretion will readily eliminate stone in the ureter. It would seem that symptoms on the part of the bladder, including cystoscopic examination and urinary analysis, should direct attention to the true cause of the disturbance. This applies also to other pelvic inflammations, such as prolapsed and adherent ovary, etc., but the possibility of both affections being present should be borne in mind.

The prognosis depends on the degree of obstruction and whether infection of the upper urinary passages has taken place or not. If it has not taken place the patient may have the disease for many years, and suffer meanwhile from the kidney, ureteral, and bladder symptoms, which become tolerable. If infection takes place, general symptoms of a more severe nature occur, and surgical interference may be imperative. If the kidney has become diseased in consequence of the obstruction, and the obstruction is finally removed, the renal function may be resumed, and repair takes place in the renal tissue, but obstruction must not have lasted more than a few months.

The treatment of partial calculous obstruction will depend on the length of time the calculus has been lodged in the ureter. Occasionally it may remain in the ureter some days, and is then passed; it is well, therefore, not to be in too great haste before relieving the obstruction. When, however, the obstruction has existed an appreciable length of time, operation should be decided upon. In all cases the operation should be extraperitoneal, for it is possible to reach the ureter in any part of its course by appropriate incisions. The ureter having been exposed, the stone is removed, the incision in the ureter closed by fine sutures, and the external wound closed, with drainage. In a list of nine cases cited by Fenger¹ seven were of the extraperitoneal variety and two of the abdominal; six of the former recovered and one died; and of the latter, one recovered and one died. In seventeen cases recorded by Tuffier and mentioned by Fenger, only three died, and in these three patients the opposite kidney was diseased. If the kidney is damaged, or if there are stones in the renal parenchyma, the question of nephrectomy comes up. If the kidney is removed it may not be necessary to remove stones in the ureter, because they may become encapsulated and may give no further trouble; but one must be sure that there is no secondary periureteritis around the stone before it is abandoned in this way. Sometimes the stone has almost reached the bladder, and may be seen with the cystoscope projecting at the ureteral orifice; an alligator forceps will often succeed in removing it.

COMPLETE OBSTRUCTION. FIBROUS STRICTURE. As has already been stated, fibrous stricture may exist in the ureter for many years

¹ Loc. cit., p. 499.

without ever becoming so narrow as to completely occlude the lumen of the canal; but there are cases in which the narrowing progresses gradually until the canal is finally completely occluded either intermittently or permanently. The subsequent changes being the same in either instance, we may therefore consider them both in one class. The inevitable result is pyelonephritis in the kidney above.

Acute obstruction of the complete variety, caused by a virulent germ, gives rise at once to acute pyelitis and pyelonephritis, the symptoms of which are of such a marked character that there is usually no difficulty in making the correct diagnosis.

The chronic cases, on account of the obscure symptoms, are of greater interest. One would naturally suppose that a chronic pyelonephritis in which the cause has been a stricture of the ureter would present symptoms referable to the kidney of so pronounced a type that there would be no difficulty in diagnosing the renal affection at once. Such is not the case. A kidney will sometimes go on to complete destruction without ever giving more pronounced symptoms than an occasional backache or uneasiness in the lumbar region. In these cases the vesical disturbances are the chief cause of suffering. One would also suppose that the general health would suffer to such a degree in these cases as to constitute a symptom of prominence; but I have seen a case in which the patient, a robust woman, maintained her general health and strength, as well as her mental equilibrium, to a marked degree, and she had suffered for many years from her stricture and from the ureteritis and pyelonephritis accompanying it. I would not be understood as saying that with a pyelonephritis the general health is never seriously undermined, for this is not the case, and the majority of patients will present general symptoms of a marked character; but I insist that even in these cases the kidney may not attract attention to itself by such decided focal symptoms as to direct attention to itself as the chief cause of disturbance. Watson¹ has recorded a very remarkable case of double-strictered ureters, which is of such interest that I wish to refer to it briefly. The patient was a young man, aged twenty-one years, who had contracted gonorrhœa one year previously. The inflammation had apparently subsided, and there was no symptom to indicate that the kidneys were damaged; but after exposure to cold a year after the apparent disappearance of all symptoms the patient was suddenly seized with chills, fever, and general prostration. The urine was diminished in amount and contained some pus and albumin; then for the first time a tumor was noticed in the left hypochondriac region, which was incised; the contents were purulent urine. Death ensued five days after the onset of the acute symptoms. At the autopsy strictures were

¹ Journal of Cutaneous and Genito-Urinary Diseases, No. 9, p. 407.

found in both ureters. The right kidney was the seat of extensive pyelonephritis, and the left one was transformed into a pyonephrotic sac. There had been no symptom on the part of the kidneys to attract attention to them. Watson in the same article refers to five other cases of a similar nature, only one of which was in a female; of the whole six cases, in three there were no focal symptoms on the part of the kidneys until within three days of death. In all six cases strictured ureters, with subsequent pyelonephritis, were present.

Secondary changes in the ureter are dilatation above the point of stricture and great thickening of the fibrous coat of the tube. The dilatation may be so extreme as to readily admit the forefinger into the lumen. Rupture is rare, although it may occur. Below the point of stricture the ureter is inflamed, and the inflammation may extend into the bladder. In the kidney the inflammatory changes are those usually seen in pyelonephritis. Dilatation of the renal pelvis occurs in the first instance if the obstruction has been gradual, and finally the inflammation attacks the cortical and medullary substance, producing in them abscesses of small and large size. The kidney is finally reduced to a mere capsule, inside of which there are septa which mark the site of previous abscesses. The entire renal tissue has been destroyed. If the patient survives, and nothing has been done, the final stage may be inspissation and drying up of the pus, and the process comes to an end. Such a result is hastened by the establishment of a fistula in the groin, either as the result of an operation or from natural causes; but the patient may succumb to the effects of the disease before this occurs, and death is usually due to some acute inflammatory exacerbation. Before concluding the subject of secondary changes it may be observed that the same changes may occur in consequence of stricture of the urethra in the female, and that in these rare instances both ureters are affected. A remarkable example of this sort is recorded by L. B. Tuckerman,¹ in the case of a girl, only five years old. She had always suffered from enuresis, and on one occasion only had had pain in both loins. There had been hæmaturia also. At the autopsy both ureters were found dilated and diseased as well as both renal pelvises. The entire urinary tract was in a state of purulent inflammation. There was stricture of the urethra, of what nature is not stated.

SYMPTOMS. The symptoms referable to the bladder are those principally complained of. They are the usual symptoms of cystitis, and need not again be enumerated in detail. Pain attending the act of micturition may be present or absent. When present it may be extreme, causing the greatest agony. Pain along the course of the ureter may sometimes be experienced, but as a rule it is not of diagnostic

¹ New York Medical Record, February 15, 1902, p. 280.

importance. Of the renal symptoms, pain is the principal one when it does occur. The pain is referred to the loin or the hypochondriac region, and may radiate into the lower part of the abdomen, even into the labium of the side corresponding to the diseased kidney. A dull aching in the loin is often complained of, and a feeling of distress especially on exertion. Sometimes the pain is not at all localized, and may be felt as a general backache in the lumbar region, being equally severe on either side. Fever is by no means a constant symptom, and Albarran¹ has shown that in more than one-half the cases of renal suppuration caused by obstruction, fever is entirely absent. There may, however, be acute attacks of pain in the kidney, and these may be accompanied by prostration, with nausea and vomiting, sweating and fever. In such cases we may suspect a temporary complete occlusion of the stricture by a shred of necrotic tissue. During such an attack there is elevation of temperature, with chills and fever and general prostration, which last until the lumen of the canal has become patent again. The urine during an attack is clear, and when the attack is over there is a large discharge of purulent urine, which brings relief with it. As for general symptoms, they include headache, anæmia, muscular weakness, disinclination to work, fatigue on slight exertion, and gastro-intestinal disturbances. The latter are very commonly found accompanying renal affections. The duration of the foregoing symptoms may be many years if the condition is not properly recognized and treated.

On physical examination we may derive important information. Bimanual examination of the bladder sometimes elicits pain; and if we examine the suspected ureter at the same time we may find that it is enlarged and boggy if the stricture is low down and the obstruction is complete, so that a condition of pyoureter exists. If the ureter is very much enlarged it may be felt abdominally, but the cases are rare in which this can be done. Over the kidney region, in the hypochondrium, just below the ribs, pressure with the hand will generally evoke resistance of the abdominal muscles. This is a valuable sign indicative of inflammatory renal disease. Bimanual examination of the kidney may detect enlargement if this is present. Fluctuation is rarely detected unless there is a large amount of fluid in the kidney.

The changes viewed through the cystoscope may be those seen in a chronic cystitis with constant reinfection. There is great injection, affecting the whole surface of the bladder, especially in the neighborhood of the vesical neck and trigone. Small superficial ulcerations are scattered about here and there, especially in the vicinity of the ureteral orifice corresponding to the diseased side. The ureteral orifice is

¹ *Étude sur le Rein des Urinaires.* Paris, 1889, p. 106.

sometimes quite deeply eroded if ulcerative changes are at all marked, and there may be considerable difficulty in locating the orifice, owing to the destruction of the landmarks. In such a case the opening may be sometimes found by seeing a gush of pus and urine well up from the bladder, in the vicinity of the spot where the eminence should be. The separated urines give evidence of value. On the affected side pyuria is marked. The amount of pus is always excessive, and collects at the bottom of the glass in quite a deep layer. This large amount of pus is quite diagnostic of pyelitic affections. Hallé¹ relates a case in which toward the end of life 300 grammes of pus were voided in twenty-four hours. The pus may have a fetid odor. Albumin is present in large amounts. The specific gravity is very low, and the reaction is usually acid unless the infection has been produced by one of the germs giving rise to alkalinity, such as the *proteus vulgaris*.² The sediment contains the usual elements—casts, various forms of epithelia, and blood corpuscles.

Some difficulty will sometimes be experienced in passing the stricture with even a small-sized ureteral catheter; usually, however, with patience and continued effort this difficulty is overcome. When the stricture has been passed a gush of accumulated urine and pus rushes out of the catheter and at once establishes the diagnosis.

Four courses are open for consideration in the treatment of fibrous stricture with pyelonephritis and violent cystitis: The first is nephrectomy; the second is gradual dilatation of the stricture with bougies, combined with repeated washings of the renal pelvis with antiseptic solutions carried up to the kidney by means of a long renal catheter; the third is the performance of a cystotomy, with the idea of relieving the distressing symptoms on the part of the bladder and of allowing the kidney to go on to complete destruction, in the hope that it will atrophy and give rise to no further disturbance; the fourth is making an artificial fistula above the strictured portion of the ureter.

If it is tolerably certain that the kidney has ceased to be actively functioning, as determined by the examination of the separated urines, the methylene blue test, and by cryoscopy, and it is fairly certain that it is not worth saving, the idea of nephrectomy may be entertained. Nephrectomy may sometimes become imperative, as, for instance, when a general infection of the body threatens. Perinephritic abscess sometimes supervenes in these cases of pyonephrosis; and if the symptoms incident to such a complication are marked, as they are quite certain to be, the safest treatment is preliminary incision and evacuation of the pus, and secondary nephrectomy later, when the patient has recuperated from the acute septic condition.

¹ Loc. cit., p. 113.

² T. R. Brown. Johns Hopkins Hospital Reports, 1901, vol. x., Nos. 1 and 2, p. 28.

The treatment of pyonephrosis associated with stricture by means of dilatation of the stricture, combined with repeated washings of the renal pelvis with antiseptic solutions, has much to recommend it, and it is especially to be considered in those cases of pyonephrosis which have not yet been of sufficiently long duration to have destroyed a very large portion of the renal parenchyma. The method consists in passing the renal catheter up to the renal pelvis through the stricture, which is at the same time dilated; antiseptic solutions are then allowed to flow through the catheter, and local treatment is thus given every few days. Kelly¹ records a case treated in this way. The patient was a female, aged thirty-one years, with a spiral stricture of the ureter. The stricture was dilated with ease up to 6 millimetres, and the kidney and ureter treated with washings of bichloride of mercury solution in the strength of 1:150,000 to 1:16,000, and of nitrate of silver solution in the strength of 1 per cent. The infection was cured and the pus disappeared; but in spite of the dilatation of the stricture there still existed a condition of hydroureter, and the accumulated urine above the stricture was 100 cubic centimetres. Kelly thought the hydroureter to be due to loss of elasticity of the ureteral walls. Pawlik² had a similar case of stricture, with pyoureter, which he cured after thirty treatments of the same nature as that employed by Kelly. Morris³ reports another of Kelly's cases in which a stricture and pyoureter were treated in this way without success. The patient had six treatments at intervals of twelve days, but as each treatment was followed by exacerbation of pain and distress, it had to be abandoned; a uretero-vaginal fistula was finally made for the relief of the pyonephrosis. It would appear from the report of these cases that the method is sometimes successful in relieving pain and distress, that it sometimes cures the patient, and that it is sometimes not tolerated at all.

It will sometimes happen that the patient will not entertain the thought of nephrectomy. In such a case it is essential to do something to relieve the distressing symptoms on the part of the bladder; but if the kidney is the source of considerable disturbance from the accumulation of purulent urine within it, simple cystotomy will not give much relief except in so far as it relieves the vesical symptoms. With a "silent" kidney, however, cystotomy will at once put the patient in a condition of comparative comfort, and she enjoys life once more. It is possible at the end of many months that the kidney process may come to an end, and the final stage of inspissation and atrophy takes place. It is conceivable under such circumstances that

¹ Operative Gynecology, vol. i. p. 438.

² Albarran and Lluria. *Comptes Rendus de la Société de Biologie*, 1891, vol. iii., No. 24, p. 543, and No. 26, p. 587.

³ *Surgical Diseases of the Kidney and Ureter*, vol. ii. p. 439.

the patient might get entirely rid of her infection and recover, in which case the fistula might be closed.

A fistula above the stricture may sometimes have to be made if for any reason nephrectomy or other methods of treatment are impracticable. The indications are distressing focal symptoms on the part of the kidney. The fistula may be made into the vagina, provided the stricture is low enough, or it may be made into the loin if the stricture is a high one. Subsequent nephrectomy should be entertained if this operation is practicable, depending on the decision of the patient and her general condition.

CASE I.—Mrs. C. F. B., aged thirty-five years, was first seen in September, 1898. She was a strong woman, of rather nervous temperament, but under good control. Symptoms had been of two-years' duration. Frequent micturition attended with pain were the first symptoms noticed. The desire to empty the bladder was constant, and urination was necessary every hour, day and night. The general health was excellent. On examination some sensitiveness was discovered over the course of the left ureter at the pelvic brim, and, vaginally, pressure over the same ureter was sensitive. On cystoscopic examination the urethra and whole bladder were generally injected, especially the left hemisphere, and particularly about the left ureteral orifice. The left ureteral eminence was covered and apparently obliterated by cicatricial tissue; its orifice was not seen, and the ureter was not catheterized at this examination. Around the left eminence were many small, superficial ulcerated areas, about one centimetre in diameter, which bled easily on being touched with a probe. At a subsequent examination the left ureter was entered, and a tight stricture discovered about six centimetres from the ureteral orifice. Immediately on passing the stricture there flowed from the catheter eighteen cubic centimetres of purulent urine, thus proving a condition of dilated ureter with retention. The right ureteral urine was not remarkable, and showed a urea percentage of 1.77 per cent. The left ureteral urine showed a urea percentage of 0.63 per cent. It was of a pale, turbid color, containing a trace of albumin; and the sediment, considerable in amount, consisted of pus chiefly, some medium-sized epithelium, a few round cells, and granular detritus; no tubercle bacilli were found. Guinea-pig tests were negative. As the patient refused any serious operation, an artificial vesico-vaginal fistula was made. Immediate relief followed, and she has been comfortable ever since. In this case there was undoubtedly a "silent" kidney which never gave any trouble. At present the patient is perfectly comfortable, and she steadfastly refuses operation of any kind. She has had her fistula nearly five years. Lately an X-ray photograph was taken, with a negative result as regards stone.

CASE II.—Miss T., aged twenty-two years, was seen in January, 1897. Six years previously she had a fall from a hammock, and from that time her symptoms began. When first seen she was in poor general condition. She had lost a good deal of flesh, was very anæmic, and was very nervous and irritable. She had never had any pain in either lumbar region, and there had never been any symptoms on the part of the kidneys to attract attention to them. The usual symptoms

of cystitis were present in a marked degree, and constituted the principal source of suffering. On examination there was some resistance of the muscles over the right kidney, and vaginally the right ureter was larger than normal, and could be felt as a hard cord. The bladder showed the usual appearances of violent cystitis, including ulceration of the right ureteral orifice, which was entirely destroyed.

On catheterizing the right ureter a tight stricture was discovered a short distance from the bladder. The left ureteral urine was normal, but the right ureteral urine contained a large amount of pus, casts of the hyaline and granular variety, and different sized cells. The urea percentage was 0.63 per cent., while on the left it was 2.4 per cent. Guinea-pigs were inoculated, but the result was negative. In February, 1897, a lumbar incision was made and the kidney removed. It was entirely destroyed, with the exception of the capsule and a small amount of tissue underneath it. The ureter was much enlarged and thickened, and admitted the little finger with ease. The operation was entirely successful, and the symptoms rapidly disappeared shortly after it was performed. She was last heard from in June, 1899. She was then well and about to be married. There were no vesical symptoms.

CALCULUS IN THE URETER. Complete obstruction due to calculus in the ureter has been, in the majority of cases, preceded by symptoms and signs pointing to calculus of the kidney. The effect of aseptic permanent closure of the ureter by this means is atrophy of the kidney within a few months, the organ becoming reduced to mere fibrous tissue. In the autopsy records of the Boston City Hospital is the report of a case in which a calculus was lodged in one of the two ureters leading from the same kidney. The portion of the kidney drained by this ureter was atrophied, while the other portion, which was the lower, was perfectly normal. Ralfe and Godlee¹ have recorded a remarkable case in which a calculus was present in either ureter simultaneously. Anuria followed, and an operation upon the right ureter discovered the stone impacted two inches below the pelvis of the kidney. The left ureter was then explored, but the stone was not found; it was passed later. If infection has been present in the pelvis of the kidney before the stone has descended into the ureter, or if it has taken place subsequently, pyelonephritis follows in the kidney. Pyonephrosis is the final ending, the kidney being reduced to a thick-walled cyst containing much or little pus. In some instances of ureteral calculus the periureteral tissue is inflamed, and abscess may occur, resulting in fistula, which may open into the loin. In the autopsy records of the Boston City Hospital is the report of a case which presents unusual features. The patient during life suffered from obscure abdominal symptoms referred to the region of the left kidney. Death resulted from general peritonitis, and at the autopsy the left kidney was found

¹ Clinical Society's Transactions, London, 1889, p. 155.

lying beneath a ruptured abscess cavity which had no connection with the kidney or its capsule. In the ureter were found two stones, one lying impacted 13 centimetres below the renal pelvis, and another a short distance below this; the ureter was not completely obstructed. Behind the ureter, and on a plane with the first stone, was a small abscess cavity, $3 \times 2\frac{1}{2}$ centimetres in dimension, in which there was a third stone; this cavity was in direct communication with the large abscess cavity directly in front of the kidney. What probably happened was gradual necrosis and solution of the ureteral wall, occasioned by the pressure of the first stone, which was the oldest one; then secondary abscess in the periureteral tissue; and, later, extension of the abscess to the region in front of the kidney.

The ureter itself may become thinned by pressure, or it may be greatly thickened and dilated. Below the calculus the ureter may become converted into an impervious cord. Changes in the bladder are those due to cystitis.

The symptoms of the affection are frequently obscure as regards location of the calculus. If high up calculus in the ureter cannot be diagnosed from calculus in the kidney, as the symptoms are identical in each. Sudden impaction is evidenced by severe renal colic and possibly hæmaturia. After the first attack of renal colic the pain gradually subsides, and then come on the symptoms of pyonephrosis. The course now varies according as the infection is virulent. If it is virulent, focal symptoms point to the affected kidney; or, on the other hand, with a mild affection the patient may relapse into a condition of toleration. The stone remains embedded in the ureter, and gradual disorganization of the kidney takes place. Some discomfort and uneasiness may be experienced on the affected side, with occasional pain in the lumbar region. Sometimes a tumor below the ribs may be felt by the patient. The cystoscope may show changes in the vicinity of the orifice of the affected side, especially if there has been preceding cystitis.

The urine in complete obstruction will not flow on the affected side, and this constitutes an important diagnostic sign. Periodical discharges of pus point to intermittent complete closure.

The diagnosis is made by a careful survey of the previous history of the case. Previous attacks of hæmaturia are of great diagnostic value, as are also attacks of colic. The X-ray should always be used to determine the seat of the stone; it will not always be successful in locating it. If an exploratory incision is made into the kidney the diagnosis of ureteral obstruction may be made by passing a sound into the ureter from above, but the same result is arrived at by ureteral catheterization through the vesical route. If the latter is done the nature of the obstruction cannot, however, be accurately deter-

mined. Vaginal touch will sometimes locate a stone, which may be felt as a hard mass under the examining finger.

The treatment of complete obstruction is surgical. As to the kind of operation selected, this will depend on the condition of the kidney and the length of time that impaction has existed. It is not proposed to discuss the various methods in detail.

TUBERCULAR URETERITIS. The frequency with which tuberculosis affects the ureter may be seen by the following figures: In 3424 autopsies performed at the Boston City Hospital and at the Massachusetts General Hospital during the past ten years tuberculosis of the kidney occurred 64 times, of which cases 24 were of the caseous variety and 40 of the miliary. In the 24 caseous cases the ureter was diseased as well as the kidney; in the remaining cases it was not affected. In 194 cases of nephrectomies which I have collected from various sources, tuberculosis of the ureter was mentioned 27 times as a complication of the renal disease. Probably we may add to this number, allowing for cases not mentioned.

In this form of ureteritis the ureter may be greatly increased in size. Usually the canal remains patent in spite of its tortuosity and in spite of the numerous shreds which descend from the kidney. Sometimes it does become occluded in this way, and when it does dilatation of the canal ensues as well as more rapid destruction of the renal tissue above. This dilatation may sometimes reach an enormous size, and the cavity thus formed may hold many ounces of pus.

The symptoms referable to ureteritis are so masked and overshadowed by those produced by the renal and vesical tuberculosis that they attract little attention. The main symptom, and the one which may excite suspicion, at least, that the ureter has begun to be involved, is colic. This is produced by a shred of tissue which is caught in the ureter as it descends.

On physical examination, if the disease has lasted any length of time, thickening of the ureter will always be found on vaginal examination. This thickening is quite characteristic of the disease. It is readily detected by the finger, and it is felt as a solid cord running toward the pelvic brim. It is very tender to the touch, and pressure on it excites an urgent desire to urinate. Abdominally an enlarged ureter may be felt through the abdominal walls if the patient is thin, but not otherwise. The appearances seen through the cystoscope are characteristic, and are sufficiently marked to allow of a diagnosis being made in the majority of cases. The typical tuberculous ulcers, with their raised edges and excavated appearance, are very apt to be situated near the orifice of either ureter, generally to the inner side, and miliary tubercles may be seen in the vicinity. In a very advanced stage of the disease, when the mucous membrane of the whole bladder

has been sloughed off, there may be cicatrices and corrugations. In such a case the diseased eminence may have disappeared as the result of the ulcerative changes, and there may be some difficulty in finding the ureteral orifice. The urine gives changes such as would be expected in pyelonephritis. There is abundant pyuria, and the amount of albumin is large; casts, renal elements, shreds, and lastly the tubercle bacillus are found. If, however, the tuberculous disease has not gone beyond the limits of the ureter, and has not invaded the kidney, the amount of pus may be very slight; this is a sure indication that the kidney has not been seriously involved, for with a large secreting cavity in the kidney the amount of pyuria on the affected side is always large. The diagnosis is easy. If a hard, thickened ureter is felt vaginally, tuberculosis may be strongly suspected. Additional evidence is furnished by the history of the case, the cystoscopic appearances, and focal symptoms on the part of the kidney. Finding the bacilli confirms the diagnosis.

It will be interesting to give the results of operations which have been performed upon the ureter for tuberculosis. To the 194 cases of tuberculosis which I have examined may be added Bangs'¹ list of nephrectomies, to the number of 135, and Facklam's² list, to the number of 86, making a total of 415 nephrectomies. Among these cases total nephro-ureterectomy was done 16 times, with but 1 death. The results were most excellent. Of the 16 cases 3 have survived two years or more and 1 of them four and a half years, and all the rest were doing well at the time of the report except one, which was improved only. The case which has survived four and a half years is one which occurred in my own practice. The patient was a girl of twenty, and nephro-ureterectomy was done in two sittings, and the tuberculous bladder cauterized throughout on two occasions under ether. She is perfectly well to-day, and does not exhibit a sign or symptom of tuberculosis. Of the partial resections of the ureter with nephrectomy there were 10, with no mortality; 1 of these died later; 3 were improved; in 3 the duration was not given, but they were doing well; and in the other 3 the progress was satisfactory. Of the cases among the 415 nephrectomies in which the ureter was known to be diseased, but was abandoned, there were 36. Analyzed, these cases were as follows:

¹ *Annals of Surgery*, 1898, No. 27, p. 20.

² *Die Wegen Nierenphthisie Vorgenommenen Nephrotomien*, etc. *Archiv. für klinische Chirurgie*, 1893, vol. xlv. p. 715.

Total number	36
Operative deaths	11
Operative recoveries	25
Percentage of operative deaths	30 per ct.
Operative deaths	11
Pulmonary phthisis	3
Tuberculosis of opposite kidney	2
Cause not stated	2
Uræmia	1
Exhaustion	1
Anuria	2
	11
Deaths later	7
(One year or under)	6)
Tubercular meningitis	1
Tuberculosis of opposite kidney	2
Pulmonary phthisis	2
Cause not stated	1
(Seven years)	1)
Tuberculosis of opposite kidney	1
	7
Improved (duration, a few months to five years ; persistent pyuria complained of in all)	5
Recoveries	13
Duration not given	5
One year or under	2
Two years	3
Four years	3
	13 36

We note that complete recovery may take place even if the ureter has been abandoned. On the other hand the mortality is quite large (50 per cent.), the deaths being either immediate (30 per cent.) or remote (20 per cent.). The cause of death in almost all the cases was tuberculosis in some form, suggesting, at least, that the tuberculosis of the ureter might have been the infecting centre. In one case such a result took place after a lapse of seven years. Among the ill results of abandoning the ureter are fistulæ, secondary abscess if the ureteral stump is buried, continuance and persistence of the pyuria. McCosh¹ reports the case of a man nephrectomized three years previously in whom a secondary abscess developed at the site of the ureteral stump. In another of his cases a secondary ureterectomy was required after nephrectomy, the ureter having become enlarged by a collection of pus within it. It is known, however, that a tuberculous ureter will sometimes atrophy. Brown² relates a case of a boy nephrectomized in whom the diseased ureter atrophied to a great extent ; but the boy died seven months later of tuberculous meningitis, and at the autopsy tubercle bacilli were found in the ureter which had been abandoned.

To sum up, it appears that if the ureter is abandoned further complications may be expected, and the most to be dreaded is tuberculosis in some other part of the body. The excellent results obtained by

¹ Annals of Surgery, 1899, vol. xxix. p. 757.

Ibid., p. 755.

total and partial ureterectomy encourage the belief that it will be more commonly done in the future. It seems proper to insist that total nephro-ureterectomy should be done in all cases in which the condition of the patient warrants it. The added risk of the operation is very slight if the general condition is even fair.

There are some cases of ascending infection in which the ureter becomes progressively larger from below upward. In such cases the extension to the kidney is by actual growth of the disease along the course of the ureteral wall. The separated urines may show only a slight degree of pyuria on the affected side, but the diagnosis is easily made by the thickened ureter vaginally, the vesical appearances, and by finding the bacilli. The treatment of the case will depend on the extent of the ureter involved. If a small portion only is diseased it may be possible to divert the ureter into the summit of the bladder and excise the lower portion, including the ureteral eminence and possibly a portion of the bladder, depending on the extent of the disease.

GONORRHOÆAL VULVOVAGINITIS IN CHILDREN.

BY RICHARD F. WOODS, A.M., M.D.,
OF PHILADELPHIA.

THE severe results of vulvovaginitis in the young are of sufficient importance to warrant a more careful study of the character and mode of infection of this disease. I think it is practically certain from looking over the different series of cases reported, and from a careful study of my own, that most of these cases of vulvovaginitis are gonorrhœal in nature. I think, moreover, it is equally certain from these same collected cases that this disease in children is of much greater danger than is commonly supposed, and that the results are sometimes appalling. That the greatest care and thoughtfulness should be exercised with a vaginal discharge in children, both in regard to the local treatment, the care of the eyes, and infection to others, I am sure all who have had these cases to deal with will agree. The medico-legal aspect of the case also makes it of great importance. The knowledge which we have of the superstitious belief among the poorer classes, especially among the negroes, that connection or attempted rape with a virgin will cure the gonorrhœa in a male, made many, before the fact of the facility of contagion from other sources was known, jump at the conclusion of rape, and even now there is no more delicate or difficult medico-legal problem with which physicians are called on to deal.